

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings of claims in the application:

Claim 1 (Previously Presented): A dielectric separation type semiconductor device, comprising:

a semiconductor substrate;

a primary dielectric layer disposed adjacent to a whole region of a first main surface of said semiconductor substrate;

a first conductivity type first semiconductor layer of a low impurity concentration disposed on a surface of said primary dielectric layer in opposition to said semiconductor substrate so that said primary dielectric layer is sandwiched between said first conductivity type first semiconductor layer and said semiconductor substrate;

a first conductivity type second semiconductor layer of a high impurity concentration formed selectively on the surface of said first semiconductor layer;

a second conductivity type third semiconductor layer of a high impurity concentration disposed so as to surround an outer peripheral edge of said first semiconductor layer with a distance;

a ring-like insulation film disposed so as to surround an outer peripheral edge of said third semiconductor layer;

a first main electrode disposed in contact with a surface of said second semiconductor layer;

a second main electrode disposed in contact with a surface of said third semiconductor layer;

a sheet-like back-surface electrode disposed adjacent to a second main surface of said semiconductor substrate on a side opposite to said first main surface of said semiconductor substrate; and

a first auxiliary dielectric layer disposed below said second semiconductor layer, said first auxiliary dielectric layer having a concave shape;

wherein a second auxiliary dielectric layer is disposed between said first auxiliary dielectric layer and said primary dielectric layer; and

wherein said second auxiliary dielectric layer is junctioned to the semiconductor substrate and the first auxiliary dielectric layer.

Claim 2 (Previously Presented): The dielectric separation type semiconductor device according to claim 1,

wherein said first auxiliary dielectric layer is so disposed that one end thereof is located at a position corresponding to said first main electrode; and

wherein said first auxiliary dielectric layer extends over a region of a size not smaller than 40 % of a distance between said first main electrode and said second main electrode.

Claim 3 (Previously Presented): The dielectric separation type semiconductor device according to claim 1,

wherein said first auxiliary dielectric layer is shaped in a cylindrical form having a bottom; and

wherein said second auxiliary dielectric layer is junctioned to said primary dielectric layer.

Claim 4 (Previously Presented): The dielectric separation type semiconductor device according to claim 1,

wherein said first auxiliary dielectric layer is shaped in a up-side down bowl-like form.

Claim 5 (Canceled):

Claim 6 (Previously Presented): The dielectric separation type semiconductor device according to claim 1,

wherein said second auxiliary dielectric layer is formed by a thermally nitrided film or alternatively by a CVD nitride film.

Claim 7 (Previously Presented): The dielectric separation type semiconductor device according to claim 1,

wherein said semiconductor substrate includes a p-type semiconductor region formed integrally with said semiconductor substrate.

Claim 8 (Withdrawn-Currently Amended): A method of manufacturing a dielectric separation type semiconductor device ~~in the form of a high-voltage-rated lateral array type semiconductor device implemented in a dielectric isolated substrate and having a first main electrode and a second main electrode which is formed so as to surround said first main electrode and including a semiconductor substrate disposed on a back surface side of said dielectric isolated substrate to serve as a pedestal (base), comprising the steps of:~~

~~removing said etching a semiconductor substrate by etching with KOH[,] within a region which covers said a first main electrode and extends over an area of a size not smaller~~

than 40 % of a distance between said first main electrode and said a second main electrode,

thereby removing said semiconductor substrate in said region;

forming a first buried insulation film in said region; and

forming a second buried insulation film immediately beneath said first buried insulation film in contact therewith,

thereby obtaining said dielectric separation type semiconductor device in the form of a high-voltage-rated lateral array type semiconductor device implemented in a dielectric-isolated substrate and comprising:

said first main electrode and said second main electrode which is formed so as to surround said first main electrode;

said semiconductor substrate disposed on a back surface side of said dielectric-isolated substrate to serve as a base;

a primary dielectric layer disposed adjacent to a whole region of a first main surface of said semiconductor substrate;

a first conductivity type first semiconductor layer of a low impurity concentration disposed on a surface of said primary dielectric layer in opposition to said semiconductor substrate so that said primary dielectric layer is sandwiched between said first conductivity type first semiconductor layer and said semiconductor substrate;

a first conductivity type second semiconductor layer of a high impurity concentration formed selectively on the surface of said first semiconductor layer;

a second conductivity type third semiconductor layer of a high impurity concentration disposed so as to surround an outer peripheral edge of said first semiconductor layer with a distance;

a ring-like insulation film disposed so as to surround an outer peripheral edge of said third semiconductor layer;

a first main electrode disposed in contact with a surface of said second semiconductor layer;

a second main electrode disposed in contact with a surface of said third semiconductor layer;

a sheet-like back-surface electrode disposed adjacent to a second main surface of said semiconductor substrate on a side opposite to said first main surface of said semiconductor substrate; and

a first auxiliary dielectric layer disposed below said second semiconductor layer, said first auxiliary dielectric layer having a concave shape;

wherein a second auxiliary dielectric layer is disposed between said first auxiliary dielectric layer and said primary dielectric layer; and

wherein said second auxiliary dielectric layer is junctioned to the semiconductor substrate and the first auxiliary dielectric layer.

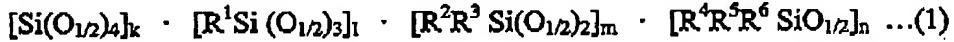
Claim 9 (Withdrawn-Currently Amended): [[A]] The method of manufacturing a dielectric separation type semiconductor device according to claim 8,

wherein said second buried insulation film is formed by comprises a cured film of at least one curable polymer selected from [[a]] the group which consists consisting of a silicone series polymer, a polyimide series polymer, a polyimide silicone series polymer, a polyallylene ether series polymer, a bis-benzo-cyclobutene series polymer, a polychinoline series polymer, a perfluoro hydrocarbon series polymer, a fluorocarbon series polymer, an aromatic hydrocarbon series polymer, a borazine series polymer, and halides or deuterides of said individual polymers-a halide of a silicone series polymer, a halide of a polyimide series polymer, a halide of a polyimide silicone series polymer, a halide of a polyallylene ether series polymer, a halide of a bis-benzo-cyclobutene series polymer, a halide of a

polychinoline series polymer, a halide of a perfluoro hydrocarbon series polymer, a halide of a fluorocarbon series polymer, a halide of an aromatic hydrocarbon series polymer, a halide of a borazine series polymer, a deuteride of a silicone series polymer, a deuteride of a polyimide series polymer, a deuteride of a polyimide silicone series polymer, a deuteride of a polyallylene ether series polymer, a deuteride of a bis-benzo-cyclobutene series polymer, a deuteride of a polychinoline series polymer, a deuteride of a perfluoro hydrocarbon series polymer, a deuteride of a fluorocarbon series polymer, a deuteride of an aromatic hydrocarbon series polymer, and a deuteride of a borazine series polymer.

Claim 10 (Withdrawn-Currently Amended): [[A]] The method of manufacturing a dielectric separation type semiconductor device according to claim 8,

wherein said second buried insulation film is formed by comprises a cured film of a silicone series polymer represented by a the following general formula (1) mentioned below:



where wherein

R¹, R², R³, R⁴, R⁵ and R⁶ represent are the same or different and represent an aryl group, hydrogen group, aliphatic series alkyl group, trialkylsilyl group, deuterium group, deuteroalkyl group, fluorine group, fluoro-alkyl group or functional group having an unsaturated bond,

k, l, m and n represent integers each greater than 0 (zero), and

[[']]2k + (3/2)l + m + (1/2) n[']] representing represents a natural number, and

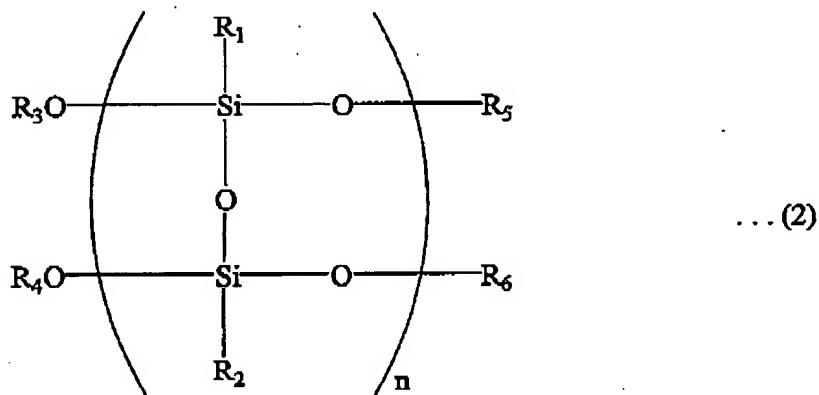
where wherein a mean molecular weight of each polymer is greater than [[']]50[']] inclusive, and

molecular terminal groups are the same or different and are an aryl group, hydrogen group, aliphatic series alkyl group, hydroxyl group, trialkylsilyl group, deuterium group,

deuteroalkyl group, fluorine group, fluoro-alkyl group or functional group having an unsaturated bond.

Claim 11 (Withdrawn-Currently Amended): [[A]] The method of manufacturing a dielectric separation type semiconductor device according to claim 8,

wherein said second buried insulation film is formed by comprises a cured film of a silicone series polymer having a ladder[-like] structure which is represented by a general formula (2) mentioned below:



wherein

R₁ and R₂ represent are the same or different and represent an aryl group, hydrogen group, aliphatic series alkyl group, hydroxyl group, deuterium group, deuteroalkyl group, fluorine group, fluoro-alkyl group or functional group having an unsaturated bond,

R₃, R₄, R₅ and R₆ represent are the same or different and represent a hydrogen group, aryl group, aliphatic series alkyl group, trialkylsilyl group, hydroxyl group, deuterium group, deuteroalkyl group, fluorine group, fluoro-alkyl group or functional group having an unsaturated bond, and

where n represents an integer, and

a mean molecular weight of each polymer is greater than [[“]]50[[”]] inclusive.

Claim 12 (Withdrawn-Currently Amended): [[A]] The method of manufacturing a dielectric separation type semiconductor device according to claim 8,
wherein said second buried insulation film ~~contains~~ comprises ~~varnish~~ varnish or alternatively resin and is formed over a whole region of said dielectric-isolated substrate or alternatively formed selectively on said dielectric-isolated substrate through an application process selected from [[a]] the group consisting of a rotor application process, a splay application process with micro-splay jets and a scan application process with a micro-nozzle.

Claim 13 (Withdrawn-Currently Amended): [[A]] The method of manufacturing a dielectric separation type semiconductor device according to claim 12,

wherein said second buried insulation layer is formed by applying a first varnish prepared by PVSQ of 150 k in molecular weight solved in an anisole solution of 10 wt % and a second varnish prepared by PVSQ of 150 k in molecular weight solved in an anisole solution of 15 wt % sequentially at 100 rpm for 5 seconds, 300 rpm for 10 seconds and 500 rpm for 60 seconds, respectively, and

wherein after said application process, a curing process is carried out by gradual cooling at a temperature of 350 ° C for at least one hour.

Claim 14 (Withdrawn-Currently Amended): [[A]] The method of manufacturing a dielectric separation type semiconductor device according to claim 8,

further comprising the steps of:

forming a crystallinity-destructed silicon layer after formation of said second buried insulation film, and

removing partially said dielectric-isolated substrate by making use of said crystallinity-destructed silicon layer as a delaminatable layer.

Claim 15 (Withdrawn-Currently Amended): [[A]] The method of manufacturing a dielectric separation type semiconductor device according to claim 14,
wherein said crystallinity-destructed silicon layer is formed by comprises a porous silicon layer.

Claim 16 (Previously Presented): The dielectric separation type semiconductor device according to claim 1, further comprising a back-surface electrode having a concave shape.